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PUBLIC WORKSHOPS ON PLANNING TO SOLVE SALT MANAGEMENT AND CONTAMINANT PROBLEMS IN THE WESTERN SAN JOAQUIN VALLEY

Response Summary

November 27-30
December 4-5, 1984

June 1985

U.S. Department of the Interior
Bureau of Reclamation
Fish and Wildlife Service
Geological Survey

State of California
The Resources Agency

PUBLIC WORKSHOPS ON PLANNING TO SOLVE SALT MANAGEMENT AND CONTAMINANT PROBLEMS IN THE WESTERN SAN JOAQUIN VALLEY

Response Summary
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Between November 27 and December 5, 1984, the Interagency Study Team hosted six public workshops to discuss salt management and contaminant problems on the west side of the San Joaquin Valley. Approximately 600 people attended the workshops, which were held in Fresno, Los Banos, Monterey, Stockton, Concord, and San Francisco. The table on page 2 shows the approximate breakdown of attendees by association.

Following opening presentations by representatives of the U.S. Bureau of Reclamation (Bureau), the U.S. Fish and Wildlife Service, the U.S. Geological Survey, the California Department of Fish and Game, and the California Department of Water Resources and a question and answer period, participants broke into four small discussion groups. In these groups, they had the opportunity to comment on and ask questions about the current alternatives, the study plan approach, the specific studies, and anything else of concern to them. They were also asked to suggest new alternatives and ideas for an interim solution to the Kesterson Reservoir problem.

We present these comments and suggestions in eight sections organized according to the subjects listed below. The questions are included in the appendix (also organized by the subjects).

- Public reaction to the current alternatives
- Suggested additional alternatives
- Interim solutions at Kesterson Reservoir
- Studies necessary for credibility
- Public attitudes toward solving the problem
- Public attitudes toward the study organization
- Public attitudes toward the workshops
- Public attitudes toward future public involvement

Who attended the workshops?

	Fresno	Los Banos	Monterey	Stockton	Concord	San Francisco	Totals
Number of people signing register at each workshop	104	98	110	84	96	93	585

	----% Distribution of interests represented at each workshop---						Total %
	Fresno	Los Banos	Monterey	Stockton	Concord	San Francisco	All
Federal Government agencies	8	7	3	8	8	19	9
State Government agencies	12	24	5	19	8	4	12
County Government agencies	1	2	5	5	6	0	3
Local Government agencies	0	3	2	4	2	1	2
Water districts	3	6	3	6	5	1	4
Other special districts	2	1	1	8	4	0	3
Universities and colleges	7	0	3	1	15	2	4
Other research institutions	0	0	2	1	1	2	1
Farmers and agricultural orgns.	23	16	5	11	1	8	11
Sportsmen groups	10	4	13	1	1	3	6
Environmental groups	7	0	15	4	3	18	8
Taxpayer groups	1	0	0	1	1	0	1
Labor unions	0	0	1	0	0	0	0
League of Women Voters	1	0	2	2	4	3	2
Business people	9	11	8	5	4	8	8
Engineers and scientists	5	0	1	2	7	5	4
Students	1	0	2	0	2	1	1
Media organizations	5	0	4	6	2	5	4
Comm. for Water Policy Consensus	0	0	0	0	3	0	1
Landowners and other residents	8	24	26	15	21	18	19

NOTE: Percentages in each column may not total 100 due to rounding.

PUBLIC REACTION TO THE CURRENT ALTERNATIVES

The study team asked participants to comment on the alternatives currently under consideration for solving salt management and contaminant problems in the western San Joaquin Valley. Although a number of people did comment, many more indicated that they require additional information before they can react. People in all workshops asked for a better explanation of the geographical scope and severity of both the salt management and contaminant problems, how the two issues differ and how they overlap, and which alternatives would solve which problem, who would benefit, and what the environmental and economic impacts of the alternatives would be.

In addition, participants asked some general questions on the alternatives and specific questions on the following topics:

- Selenium and other contaminants
- Protection of San Joaquin River water quality
- The problem of providing irrigation water for saline soil
- The feasibility of using evaporation ponds and desalinization
- The impact of discharge into the Pacific Ocean and San Francisco Bay/Delta Estuary

Comments

Many people stated that a combination of solutions rather than a single one would be necessary to solve the total drainage problem in the San Joaquin Valley. Others added that the study team must address the salinity problem immediately and not allow it to be overshadowed by the Kesterson issue (F, C, S).*

People attending the Monterey workshop stated strongly that the Monterey Bay alternative should be abandoned because discharge into the bay would violate State law. One person suggested referring to "ocean disposal" instead of "Monterey Bay disposal" and looking for other sites. Another person said that we should not look at our oceans as disposal sites at all. A participant in Concord said that since the treated water would reach the ocean eventually if discharged in the Delta, it should be taken directly to the ocean without endangering San Francisco Bay.

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* Letters in parentheses indicate the workshop location where the comment was made: F (Fresno), LB (Los Banos), M (Monterey), S (Stockton), C (Concord), SF (San Francisco).

Several Monterey, Concord, and San Francisco workshop attendees said that the problem should remain at the source, and that treatment and disposal should take place onsite. Los Banos meeting participants expressed an overall concern that any solution should include detection and stoppage of water seeping from all rivers and canals and protection of their drinking water. Los Banos area farmers stated that Congress authorized them an outlet for their drainage water when it first authorized the San Luis Drain. Drainage problems, they said, are not new. Drainage facilities were assumed with the delivery of water to the San Joaquin Valley.

The following are specific comments made regarding salinity (and desalting) and evaporation ponds.

Salinity and Desalting

Desalinization should be a prime alternative. (LB, M)

Removal of selenium from the soil is impossibly expensive and inefficient. (F)

Ionization is less costly than reverse osmosis in removing selenium. (C)

Ten to fifteen desalting plants would be necessary to make progress in the valley. (S)

Irrigation will always increase salinity. (S)

In this case, water from the Delta-Mendota Canal is making the salinity problem worse. (F, LB, S, SF)

Evaporation Ponds

Solar ponds have not as yet been proved viable. (C)

It would take many acres of evaporation ponds to handle selenium, and it would be very slow. (F)

It would cost $20,000 per pond to double-line them. (F)

Ponds are a danger to wildlife. Evaporation ponds would equal 1,000 Kestersons. (F, S, SF)

Do not even consider ponds in high selenium areas. (S)

Let every farmer have his own ponds. (S)

SUGGESTED ADDITIONAL ALTERNATIVES

At all the workshops, people expressed the sentiment that although an interim solution might be necessary at Kesterson, only long-term solutions would be acceptable for solving the salt and contaminant problems in the greater San Joaquin Valley.

As well as asking questions and commenting on current alternatives, participants suggested a number of additional alternatives. These alternatives fell, for the most part, into one of three categories:

- Farming practices, including land in production, irrigation methods, and cropping patterns
- Methods of treatment, with a particular emphasis on ways of diluting the drainage water
- Methods of disposal, including uses for the treated water and the byproducts of the treatment

Below are these suggestions organized according to the three categories mentioned plus one general category.

Farming, Irrigation, Crops

Take land out of production. (S, SF)

Change cropping patterns, including use of more salt-tolerant crops. (All)

Return to dry-land farming. (M)

Require farmers to prove the purity of their land before they grow crops on it, just as water districts must certify their water before selling it. (S)

Shut off water supply to the "hot spots." (C)

Prohibit ground-water pumping in the problem area. (C)

Require water conservation measures in problems areas, including use of drip irrigation. (S, SF)

Shut off the tile drains. (F)

Methods of Treatment

Pond the water and release it into the San Joaquin River during high flows. (F, LB)

Maintain more continuous flows from New Melones Dam, in order to keep more water in the San Joaquin River. (S)

Dilute the drainage water in the San Luis Reservoir. (S)

Dilute the drainage water brought via an east-side canal from the Tuolumne River basin.

Use electrochemical reduction to eliminate selenium. (C)

Use solid phase electrodialysis, resulting in the complete purification of saline water and the removal of all contaminants for sale or use. (C)

Clean up the water before it leaves the agricultural land. For example, add chemicals to counteract toxicity at the source or in the tile drains or filters. (LB, C)

Use algae to remove selenium from water. (F)

Use plants to draw selenium from the soil. (LB)

Have all water districts require their water users to have evaporation ponds. (LB)

Blast holes in the hard layer so that the water can drain. (M)

Methods of Disposal

Inject the water deep into the ground or into abandoned oil wells. (F, M, S)

Sell clean irrigation water to southern California for drinking water or for industrial consumption and use the money to offset the cost of idling farmland. (M, C)

Create a disposal pond like the Salton Sea.

Develop a "dead sea" between the Gustine Airport and the San Joaquin River with evaporation ponds and a means of "harvesting" the precipitated agriculture water. (C)

Turn Kesterson Reservoir into a salt management area. (C)

Tunnel directly to the ocean and send drainwater through the tunnel. (LB)

Consider using a movable disposal point; e.g., a tanker, especially if depositing concentrated brine. (C)

Put the selenium on the other side of the valley, which is selenium deficient. (F)

Use evaporation byproducts as impervious core material in dams. (F)

Use land taken out of production because of high salinity for evaporation ponds. (M)

Use the Panoche Fan area as a disposal site. (M)

General Alternatives

Stop the selenium at its source before it leaves the mountains. (F, LB, S)

Line and cover all supply and drainage ditches. (F)

Stop the seepage from all rivers and canals, since that's what causes the high water table in the first place. (LB)

Farmers in the problem area should solve their own problem with some help. (SF)

INTERIM SOLUTIONS AT KESTERSON RESERVOIR

The study team asked participants to suggest interim solutions to the contaminant problem at Kesterson. Most people indicated that they did not have enough information to help guide the team in its search for an interim solution. As in the case of the current alternatives, many more people asked questions about Kesterson and the San Luis Drain than offered solutions.

Suggestions

Suggested interim solutions are the following:

- Stop water deliveries to the 8,000 acres draining into Kesterson. (F, S, C, SF)
- Cap Kesterson. (LB)
- Flush Kesterson during the winter flood season. (F, LB)
- Relocate people living in the Kesterson area. (SF)
- Allow only drip irrigation in the area draining to Kesterson. (F)

- Pay farmers not to grow on the 8,000 acres. (F, LB, S)

- Provide one of the following incentives to farmers to temporarily idle their lands: Reduce taxes, give FMHA-Land Bank payment waivers, reduce loan interest, defer loan payments. (F)

Several people stated that taking land out of production temporarily will not work because it would take so long--perhaps as long as 50 years--to bring the land back.

STUDIES NECESSARY FOR CREDIBILITY

In all the workshops, people asked many questions about and made suggestions for studies that they considered necessary to a complete analysis of the drainage and contaminant problems in the valley. Two subjects came up in every workshop:

- That all trace elements, not just selenium, should be studied

- That human toxicity studies and the effects of bioaccumulation in the food chain are of primary importance

Comments

The following are comments and suggestions made regarding the studies necessary:

Look at the entire valley, don't limit studies to Kesterson. (S)

Study all trace elements, pesticides, and other contaminants, including what kind of nutrient uptake is occurring. (All)

Look at <u>all</u> impacts--social, environmental, economic. (S)

Consider the impact of contaminants on endangered species such as the Giant Garter Snake. (S)

Study the characteristics of the Delta fish nursery. Look at whether impacts on the nursery would be more severe than impacts on the adult marine environment. (C)

Examine fish, clams, and crayfish in the San Luis Drain and Santa Fe Canal to determine toxicity. (LB)

Concentrate studies on sea life and the toxic effects of various forms of selenium. (LB)

Look at the marine environment, realizing that Moss Landing, Elkhorn Slough, and Monterey Bay are unique and environmentally sensitive. (M)

Study the importance of the marine environment as a human food source. (M)

Study the effects of drainage water upon plankton. (M)

Study the background problems of Monterey Bay. Consider the interaction between the impacts of those problems and impacts that would be caused by discharging into Monterey Bay. (M)

Conduct studies on San Francisco Bay. (LB)

Study potential for eutrophication of San Francisco Bay. (SF)

Research estuarine needs. (SF)

Monitor shallow wells to protect against intrusion of selenium, pesticides, herbicides, and other contaminants. (C, LB, SF)

Monitor Los Banos drinking water to determine that drainwater is not seeping in. (LB)

Identify a way to stop seepage from all waterways. (LB)

Look for ways to use selenium and other elements productively and cost effectively. (F, M)

Selenium has been found in sheep for a long time. Study the effect it has had on the sheep. (S)

Consider selenium an extreme hazard. (LB)

Look at ways to protect people and animals from selenium in the air and through skin contact. Contact with this poison is currently too easy. (LB)

Develop an indepth biological inventory in Kesterson and Grasslands. (S)

Determine why ducks and pheasants are declining in the Grasslands area. (LB)

Look at using algae and fuel cells for cleanup of trace elements. (M)

Identify ways to protect areas with good water. (LB, S)

Consider statewide agricultural practices; i.e., cropping patterns and irrigation methods. (S, SF)

Consider the efficiency of tile drains. (F)

Study water conservation. (M)

Measure the moving water in the drain to identify the relationship between the quality and quantity of the water. (LB)

Do more studies on treatment. Water should be completely treated before it is put anywhere. (M)

Determine acceptable water quality for its use. Drainage water need not meet drinking water standards. (F)

Study solar energy ponds. (M)

Identify the geochemistry of evaporation ponds. (C)

PUBLIC ATTITUDES TOWARD SOLVING THE PROBLEM

In general, workshop participants exhibited a conflict in attitudes between a desire to help San Joaquin Valley agriculture and a desire to protect the environment in the valley, the San Francisco Bay-Delta Estuary, and the Pacific Ocean. While some people expressed the view that these two attitudes would be brought into harmony, people expressing a strong feeling about the environment were skeptical.

People argued for a study that fully examines and compares:

- All benefits, specifically identifying who would receive them
- All costs, specifically identifying who would bear them

Comments

The Bureau has a moral responsibility to financially aid farmers to whom they supply water if those farmers are required to take their land out of production. (F, LB, M, S)

If farmers are compensated for lost farming land, the compensation should be based on when the farmer bought the land; that is, whether or not he knew there were problems. (S)

The study team must look at high-salt areas and decide whether or not they should really be farmed. They must compare economic and environmental costs and consider the economics of alternative uses of the land and the water. (SF)

We need an economic profile (GNP) of the 8,000 acres draining to Kesterson, including taking land out of production. (SF)

The 2,200-acre average sized farm in Westlands is a violation of Federal law. The study team needs to do a socioeconomic analysis of who is on this land and who is benefiting from the studies. (SF)

Consider surplus crops being farmed on saline land. (SF)

The primary crop is cotton, a surplus crop, because of the cheap water. (C)

The Bureau must consider the socioeconomics of shutting off water supply or drainage: What happens to the farmer and the local, national, and international economy? This is not an isolated problem. (LB, C, M)

You can't put a price tag on socioeconomic factors. (M)

A change of crops might not be economical. (LB)

Consider the cost of stopping row-type irrigation. (C)

Look at the economics on a statewide and nationwide basis, including consideration of the current cost of price supports and subsidized water in determining the costs of suspended farm production. (M, C, SF)

Federal water should not be subsidized more than State water. Or farmers receiving Federal water should pay a surcharge for a drainage solution. (C)

Put the subsidy money into conservation methods such as drip irrigation. (C)

The Bureau should have invested the money it used to subsidize water for building drainage facilities. (C)

The striped bass fishery should be part of the total economic evaluation. (SF)

Other industries must pay for their own waste disposal; the farm industry should too. That is, the people who cause the problem should pay to solve it. (C, SF)

I don't mind paying my share for a solution. We must weigh the total social benefit. (C)

Look at whether it would be more economical to have private industry rather than the Government coordinating operation of the selected alternative(s). (S)

Costs are not as important as consequences. Consider the "multiplier" costs of alternatives. (SF, M)

Look at the economic value of wildlife even at the international level because of the migration of birds. (SF)

Environmental concerns must override economic concerns. (SF)

We need more information on all types of costs. (S)

PUBLIC ATTITUDES TOWARD THE STUDY ORGANIZATION

The study team asked participants to comment on the study organization and proposed study approach. Many of their questions and responses concerned specific studies. We have included this information in the section "Studies Necessary for Credibility." A discussion of comments specifically dealing with the study organization follows.

A Fresno participant suggested that the study team use a classic study management approach, including relieving team members of other responsibilities. Another person said that it is important that agency representatives work together in a nonpolitical atmosphere. In San Francisco, a participant said it was important to begin with a short, clear statement of goals.

Some people expressed concern over the structure of the study team management. One suggestion was that the lead agency concept be abandoned in favor of one where all agencies are on equal footing (SF). Another suggestion was that an independent research agency rather than the Bureau coordinate the study effort (F). In Monterey, several people suggested that the Bureau should not be involved at all, since it seems to them unwilling to uphold local and State ordinances.

One of the main concerns of meeting attendees was how responsibility for the various parts of the study is allocated. Specific questions included which agency is responsible for which studies (LB, M, S) and when study reports will be published and by which agency (M). People at all workshops also asked for a description of the decisionmaking process, including how and by whom final decisions will be made.

Participants suggested that to increase credibility, the following agencies, interest groups, and individuals should be added to the study team:

- University of California (F, SF)
- U.S. Department of Agriculture (F, SF)
- U.S. Department of Commerce (SF)

- National Marine Fisheries Service (SF)
- National Park Service (SF)
- National Science Foundation, as an agency for independent scientific review (F)
- Committee for Water Policy Consensus (SF)
- Independent scientists who have dealt with the problem in other parts of the country or the world (F, LB, M)

People attending the Fresno and Los Banos workshops expressed concern about the amount of time involved in finding and then implementing solutions. They stated that results to date do not reflect the amount of time and money that has been spent in studying the problem since 1946, adding that during another 5 years of study, more natural resources will be lost.

One person in Stockton suggested that the study team should determine criteria for the alternatives early so that they can limit the studies that must be done. A Fresno participant said that to facilitate a solution, experts should make the decisions without the advice of the public who all have biases.

At the same time, several people said that it is important for the study team to study all issues fully before making a decision so that the solution will be one that is long lasting and will follow along with changes in the valley. (F, M, S)

PUBLIC ATTITUDES TOWARD THE WORKSHOPS

Overall, people at all of the workshops expressed satisfaction with the workshop format. At each meeting, participants had the opportunity to fill out workshop evaluation forms. Approximately 30 percent of the participants turned in completed forms. The table on pages 14 and 15 summarizes the responses.

Reasons given for the success of the workshops were that they gave people of varying opinions an opportunity to hear one another's views and promoted understanding, that they provided a good way for the Government to communicate information to and get questions and comments from the public, and that such an open forum educates and promotes good ideas, while avoiding politics.

But there were some criticisms. Some people attending the Monterey workshop criticized the workshop format because they had come prepared to give formal testimony. The workshop had been announced by local papers as a public hearing.

PUBLIC WORKSHOPS ON PLANNING TO SOLVE SALT MANAGEMENT AND CONTAMINANT PROBLEMS IN THE WESTERN SAN JOAQUIN VALLEY

Workshop Evaluation Results

November 27-30, December 4-5, 1984

How informative was the public notice of the workshop (please circle one)?

	Not Informative 1	2	3	4	Highly Informative 5
Response	%	%	%	%	%
All	16	10	27	33	15
Fresno	15	12	18	41	15
Los Banos	4	7	36	36	18
Monterey	48	8	12	20	12
Stockton	9	6	34	28	22
Concord	9	9	28	38	16
San Francisco	13	17	35	30	4

How much did you get a chance to participate and comment (please circle one)?

	Not At All 1	2	3	4	Completely 5
Response	%	%	%	%	%
All	1	6	20	34	38
Fresno	3	11	11	32	43
Los Banos	0	0	44	24	32
Monterey	4	27	19	38	12
Stockton	0	0	13	39	47
Concord	0	0	28	38	34
San Francisco	0	0	14	32	54

How well did this workshop meet your expectations (please circle one)?

	Not At All 1	2	3	4	Completely 5
Response	%	%	%	%	%
All	3	15	38	32	11
Fresno	0	9	34	51	6
Los Banos	0	22	41	30	7
Monterey	17	38	13	25	8
Stockton	3	10	42	32	13
Concord	0	6	52	26	16
San Francisco	3	14	45	24	14

How satisfying were the opening presentations by Coordination Team members (please circle one)?

	Not At All 1	2	3	4	Completely 5
Response	%	%	%	%	%
All	3	18	37	28	14
Fresno	0	19	42	25	14
Los Banos	0	15	37	41	7
Monterey	8	25	38	25	4
Stockton	0	17	42	25	17
Concord	0	0	28	38	34
San Francisco	16	36	32	16	0

PUBLIC WORKSHOPS ON PLANNING TO SOLVE SALT MANAGEMENT AND CONTAMINANT PROBLEMS IN THE WESTERN SAN JOAQUIN VALLEY

Workshop Evaluation Results

November 27-30, December 4-5, 1984

(continued)

How well did the Coordination Team members answer questions that you or others asked (please circle one)?

	Poorly Or Inadequately 1	2	3	4	Completely 5
Response	%	%	%	%	%
All	3	15	32	38	12
Fresno	0	9	31	31	29
Los Banos	0	8	46	46	0
Monterey	13	26	17	26	17
Stockton	3	14	11	59	14
Concord	6	18	38	35	3
San Francisco	0	17	52	24	7

How well did the small group discussion facilitators and recorders perform (please circle one)?

	Poorly Or Inadequately 1	2	3	4	Extremely Well 5
Response	%	%	%	%	%
All	3	5	19	39	34
Fresno	3	3	19	31	44
Los Banos	4	4	19	37	37
Monterey	9	17	30	26	17
Stockton	0	5	13	37	45
Concord	0	3	21	50	26
San Francisco	7	0	14	52	28

How satisfying was the small group discussion format (please circle one)?

	Not At All 1	2	3	4	Completely 5
Response	%	%	%	%	%
All	2	11	18	46	22
Fresno	0	8	11	56	25
Los Banos	4	16	16	36	28
Monterey	9	26	35	30	0
Stockton	0	5	24	42	29
Concord	0	9	12	59	21
San Francisco	3	10	17	48	21

People at all workshops stated that advance announcement of the workshops had not been sufficient and that, as a result, the study team might not be getting the views of all members of the community. In Fresno, someone said that the discussion group time was too short to cover all the issues.

Another person in Fresno said that the workshop was viewed as a sham, while someone stated in Monterey that a "public relations" firm should not front for the Bureau in the workshops. A comment made in Los Banos was that all the agencies had supplied too much information.

Most participants said that they would attend further workshops, although several people in Concord said that their attendance would depend on whether the study team paid attention to what was said at the first set of workshops.

PUBLIC ATTITUDES TOWARD FUTURE PUBLIC INVOLVEMENT

Participants were asked what types of public involvement they would like to have for the duration of the study. While they identified several types of public involvement and public information activities, more than 50 percent of all questions and comments about future public involvement dealt with some kind of citizen or expert committee. People in Monterey and San Francisco were especially interested in a committee, stating that while workshops are valuable and necessary, they are no substitute for a committee of nonpartisan experts or citizens.

Other types of public involvement receiving widespread support were more workshops and the distribution of information through publications. Specific comments and suggestions on these and other activities follow.

Citizen or Expert Committee

Participants stated that a citizens committee would be valuable for three reasons:

- It would increase the credibility of the study team and its recommendations.
- It would provide an efficient means of communication among various regions, interest groups, and agencies, thus building understanding and trust.
- It would provide an opportunity for indepth understanding of the problems and potential solutions by people who are committed to "doing their homework."

People generally agreed that representation on a citizens committee should be regional as well as organizational. Representatives should include farmers, environmentalists, retired technical experts, students, concerned lay people, water agency personnel, local government officials, sportsmen, and resource people. In Stockton, someone stated that the committee must be under the Federal Advisory Committee Act.

Some people suggested that there also be a nonpartisan technical review team comprised of top-level scientists. This group was also seen as a means to credibility, both scientific and political. Another suggestion was using the inplace State environmental structure to build an environmental oversite committee.

Workshops

Participants at all meetings supported a plan to hold additional workshops during the study process. They also made a number of suggestions concerning additional locations for future workshops, types of workshops, and format changes.

Following are suggested future workshop locations:

- The Hanford area, to encourage participation by more farmers. (F)
- San Luis Obispo and Kern Counties, to discuss proposed disposal sites in those counties. (LB, M, S, SF)
- Imperial County because farmers there have similar salinity problems. (F, S)
- Los Angeles County because decisions could affect its water supply and economy. (F, C, SF)
- The area of any additional proposed disposal sites. (LB, M, SF)
- Selected locations throughout the State, since the problem is not localized. (M)

People at all workshops stated that they would like to have technical experts, both governmental and independent, present technical data and answer technical questions at future workshops. A suggestion made at several meetings was that there be two types of workshop: One type dealing with specific technical issues, another with issues of general interest. In Fresno, someone stated that workshop participants should have the opportunity to communicate with decisionmakers, not just their staffs.

Some people in San Francisco asked that future workshops be held at night or on a Saturday, rather than on a weekday afternoon.

A comment made in Concord was that having an agenda during the small-group discussions is limiting; an open format where everyone can say what he or she wishes would be more valuable. In Fresno, someone suggested having a more structured agenda for the small-group discussions.

Publications

People agreed that four types of documents would be most useful to them in becoming and remaining informed about the study effort.

Workshop summaries should be easy for the lay person to understand and should be comprehensive, including comments and questions from all workshops and study team responses to the questions. The Bureau should send the summaries to the press, along with information on the next public involvement step.

Bulletins should provide indepth technical information on specific technical issues and should include a list of related technical reports and where they can be obtained.

Study updates should be sent out whenever there is new information to communicate and should include an up-to-date list of available reports and where to obtain them.

Technical reports and report abstracts on all studies should be available to the public through a central clearinghouse.

Many people noted that the most efficient way of getting information to the public is through the media. These people suggested that information be given to the media regularly, that the information be clear and accurate, and that it be presented in writing. Another suggestion was that press releases announcing workshops or public meetings include more information about the study and the purpose of the meetings.

Other suggested forms of public involvement included:

- A questionnaire sent to the public to collect their concerns, their views of the problem, and their recommended solutions (for example, the one used for the Yosemite Master Plan)
- Bureau representatives speaking at other groups' meetings
- Symposia on specific issues, with Government and independent experts presenting information

APPENDIX

QUESTIONS AND RESPONSES

The questions asked at the workshops are presented below in four sections organized by subject. Those questions which the study team can answer at this time have been answered. Answers to the other questions are to be addressed in the study itself.

PUBLIC REACTION TO THE CURRENT ALTERNATIVES

General

1. Will regional impacts of the alternatives be analyzed? (F)

   Yes.

2. What is the Cayucos alternative? (M)

   Discharge of subsurface agricultural drainage water in the vicinity of Morro Bay.

3. The "no-action" alternative is not defined. Does it mean taking land out of production? (M)

   "No action" means no Federal project for disposal of subsurface agricultural drainage water from either the San Luis Unit or the Delta-Mendota Canal service area. There would be no Federal action taken to directly remove land from production; however, without adequate subsurface drainage, gradually increasing acreages would cease being farmed.

4. If you decide to take land out of production, would it be permanent? (C)

   A decision to continue or discontinue farming certain lands would not be made by the Federal or State Governments. However, a decision to discontinue irrigation water deliveries to certain land is possible. It is likely that if lands are taken out of production before the land is degraded further, it can be farmed in the future. Additional studies will be necessary to fully answer this question.

5. What is the projection 3 years from now if no action is taken? Will things be 10 times worse? (C)

   The results of no action have not been precisely defined. Information developed as a result of proposed studies will help answer this question.

6. Why do some areas require no tailwater delivery systems? Does that water run off to some other system? Is it checked for selenium? (LB)

   The need for tailwater delivery systems depends on several factors; e.g., soil conditions, irrigation practices, and contracts or agreements between neighboring water districts. Most of the districts in the Federal service area recycle their tailwater or provide it to neighboring districts. Some districts have begun monitoring their subsurface drainage water; however, no districts are known to be monitoring exclusively tailwater for selenium. The Central Valley Regional Water Quality Control Board (CVRWCQB) has begun a routine monitoring program of tailwater in the Panoche Fan area. Preliminary results indicate that selenium levels vary from 1 to 3 micrograms per liter (ug/L).

7. Is liquid or solid waste easier to dispose of? (M)

   Studies on disposal options will answer this question.

8. If you use biological treatment, what do you then do with the plants? (SF)

   The plants could be disposed of by burning, digestion, or composting or recycling to selenium-deficient areas. The Bureau will soon initiate studies on biological treatment and disposal considerations.

9. Why would you use an unlined drain to take water to the Delta? (S)

   All of the plans developed by the Bureau have called for concrete-lined canals to carry drainage water.

10. What effect will the Los Banos-Grandes Dam have on drainage in the area? (LB)

    There is no anticipation that the reservoir created by Los Banos-Grandes Dam would affect drainage in the Federal water service area on the west side of the valley.

Selenium and Other Substances

11. Selenium has always been in the soil. Why is it all of a sudden a problem? (F)

    Selenium in the subsurface drainage water stored in Kesterson has concentrated through the food chain, affecting waterfowl that eat the reservoir vegetation, fish, and other aquatic life. Without Kesterson, this specific problem might not have occurred or been recognized. The Geological Survey (GS) will study selenium sources, mobilization, and transport mechanisms to help us fully

understand why high levels of selenium exist in subsurface agricultural drainage. Methods of immobilizing selenium will be included in any plans for the disposal of subsurface drainage water.

12. How well has the selenium problem been defined? Are all the forms of the element known? (C)

    Additional studies by the GS and the Fish and Wildlife Service (FWS) are required to more completely define the selenium problem. Information Bulletin 2 discusses selenium forms and what is presently known about this trace element.

13. How long will the soil continue to leach out selenium? (F, LB, C)

    We don't know. The GS has initiated studies that will help answer this question.

14. Is selenium more difficult to leach out than are other salts? (LB)

    We don't believe selenium is any more difficult to leach out than are other elements or salts. However, we expect the studies initiated by GS will provide more substantive information to help answer this question.

15. What is the square-mile area from which the selenium is coming? (LB, M)

    Available data indicate that from 150 to 300 square miles west of Mendota contribute significant amounts of selenium to the drainage service area. However, since selenium is a natural element in the earth's crust, it is found in the shallow ground water throughout most the 1,800-square-mile drainage service area.

16. What is the source of the selenium; is it a natural or manmade problem? (M)

    Selenium is a natural element with characteristics similar to those of sulfur. The selenium in the San Luis Unit service area originated from ancient marine deposits in the Coast Ranges; it is deposited in the alluvial fans on the west side of the valley by soil erosion and surface runoff. More detailed information on selenium sources, mobilization, and transport mechanisms will become available as a result of studies conducted by the GS.

17. Is the use of gypsum as a fertilizer a potential cause of the problem, since the farmers have trucked in gypsum from the mountains thought to be the source of the selenium? (C)

    The application of fertilizers, including gypsum, appears to be an insignificant source of selenium on the west side of the valley.

18. How can you manage the "hot spots?" (M, S)

There are several ways to manage drainage water in areas with particularly high concentrations of selenium. These include isolation of the drainage water plus treatment for the removal of selenium, application of special irrigation and drainage practices to minimize the amount of selenium in the drainage water, and modification of onfarm drainage facilities to immobilize selenium. These and other management measures will be studied further.

19. What are selenium levels in the northern San Joaquin Valley? (F)

Data from the present monitoring program indicate selenium levels in shallow ground water and subsurface drainage water north of Kesterson Reservoir to range from less than 1 ug/L to 14 ug/L.

20. When did you first detect selenium in the drainage water? Was it during the heavy rains of 1982? (LB)

High concentrations of selenium in the drainage water (more than 400 ug/L) were first detected in summer 1981.

21. How long has it taken for selenium to build up? (S)

This is a question we intend to answer as part of the drainage program studies. The GS will study the sources, mobilization, transport, and concentration of selenium on the west side of the valley to provide details.

22. How much selenium is there in the San Joaquin River? The Delta? The ocean? (LB)

Concentrations of selenium as measured by the GS laboratory are:

San Joaquin River near its confluence with Salt Slough (at Fremont Ford Bridge), less than 1 ug/L to 11 ug/L,

San Joaquin River at Mossdale, less than 1 ug/L,

Delta-Suisun Bay area, less than 1 ug/L, and

Pacific Ocean, less than 1 ug/L.

23. Has San Francisco Bay been tested for selenium? (C)

Yes. The levels of selenium in the eastern portion of San Francisco Bay (east of Carquinez Strait) is less than 1 ug/L.

24. How much selenium is going to the ocean via the river? (LB)

We don't know at this time how much selenium from the valley is getting into the ocean. Estimates will be made as a part of Bay-Delta Estuary studies.

25. Is selenium considered a toxic waste? (F)

    Selenium can be toxic at high concentrations; however, limited amounts are essential for both aquatic life and mammals.

26. Has disposal of selenium been a problem in the past? (M)

    Except for the current problem in the drainage service area, no other problems associated with the disposal of drainage water or municipal wastes containing selenium have been reported in California.

27. Does the level of selenium in the soil differ a lot from state to state? (S)

    Yes, it does, and it can vary widely from place to place within the state.

28. Does selenium have more of an effect on young fish and wildlife than on adult fish and wildlife? (SF)

    The FWS has proposed studies that would answer this question.

29. Does selenium have an odor or taste? (M)

    No.

30. Does selenium affect eggs in a similar manner to DES? (M)

    No. Selenium causes developmental abnormalities in embryos such as absence of toes, twisted beaks, etc., while DES causes femininity in males.

31. Are the current levels of trace metals still below critical levels? (C)

    The current levels of trace elements in water samples vary considerably throughout the drainage service area. The projected combination of all sources of drainage water demonstrates that selenium levels are higher than acceptable for protection of public health and freshwater aquatic life. Other elements may be of concern and will be discussed in detail in a future information bulletin.

32. Arsenic is related to shale soils such as are found in the area. Is arsenic a problem? (C)

Arsenic concentrations in most of the service area range from less than detection at 1 ug/L to 9 ug/L. In the Tulare Lake Basin, in the very southern part of the service area, the maximum concentration of arsenic is 50 ug/L. However, the overall concentration of drainage water from the service area is well below existing water-quality standards and criteria.

33. Does reverse osmosis work on selenium? (C)

Available information indicates that it does. The California Department of Water Resources (DWR) has a pilot reverse-osmosis plant and will study selenium removal to see if it is feasible for the San Luis drainage water.

34. How difficult and expensive is it to remove trace elements and pesticides? (LB, M)

The difficulty and expense of removing trace elements and pesticides varies widely. The Bureau will initiate studies to assess the difficulty and cost of removing trace elements from drainage water.

35. Is a significant amount of pesticide found in drainage water? (M)

No. The concentration of pesticides in samples taken from the service area is below the acute-toxicity criteria levels established by the Environmental Protection Agency.

San Joaquin River Water Quality

36. What is the quantity and quality of San Joaquin River water? (S)

The quantity and quality of the San Joaquin River water varies considerably throughout the year and between wet and dry years. Information on flow and salinity is available in GS water-supply papers for the gage at Vernalis (downstream from the confluence with the Stanislaus River). The GS and the DWR plan to monitor trace-element concentrations in the river between Mendota and the Merced River.

37. Who determines what the quality of drainage water dumped into the San Joaquin River is? (F)

The CVRWQCB and the point-source dischargers are responsible for monitoring the quality of the drainage water entering the San Joaquin River.

38. Have selenium and other trace elements been detected in large amounts in the river? (LB, S)

No.

39. Are salts reaching the river coming from the drain or from other irrigation drainage? (S)

Agricultural drainage water is discharged directly into the San Joaquin River from lands north of Mendota and indirectly from Grassland Water District. This water increases the salt levels in the San Joaquin River. At this time, drainage flows discharged into the San Luis Drain and stored in Kesterson Reservoir do not contribute to the salt content in the river.

40. Is drainage water seeping into the river? (S)

Subsurface drainage water probably seeps into the river all along the valley floor. Water in Kesterson Reservoir seeps into the shallow ground-water aquifer underlying the reservoir; however, because the general rate of movement within the aquifer is so slow (1.7 to 6.8 feet per year as estimated by the GS), the seeped water from Kesterson should not contribute at this time to the flows in the San Joaquin River. Regardless of the rate of movement of shallow ground water toward surface channels downgradient from the reservoir, the concentration of selenium leaving the reservoir at this time is considered insignificant and does not appear to pose a threat to the environment.

41. How are drains north of Mendota policed? (F)

The CVRWQCB is responsible for monitoring the quantity and quality of drainage flows reaching the San Joaquin River. Individual water districts are responsible for monitoring flows provided to neighboring districts where specific criteria have been established for drainage water quality.

42. Is the water in the river being recycled to the Delta-Mendota Canal? (S)

Yes. A portion of San Joaquin River water is recycled back into the San Joaquin Valley by way of southern Delta channels and the Tracy Pumping Plant.

Irrigation Water

43. What was the incentive offered farmers to get them to use Central Valley Project water? (S)

Many factors influence farmers' use of Central Valley Project water for irrigation of lands on the west side of the valley. Historically, the ground-water supplies available to the farmers have been of poor quality, being particularly high in salts and boron. Farmers working with their Congressional Representatives obtained authorization and funding to provide them an alternative source of water through the Central Valley Project.

44. Where does the irrigation water come from? (S)

Almost all the irrigation water delivered to the west side of the valley comes from the Sacramento River basin via the Delta and existing west-side delivery canals.

45. What is the quality of the water in the delivery canals? Could salt actually be getting to the soil through Delta-Mendota Canal water? (LB)

All irrigation water contains some salt. The water delivered from the Delta through the Delta-Mendota Canal generally contains a total dissolved solids concentration of 150-500 milligrams per liter (mg/L) and a selenium concentration of less than 1 ug/L. This means that from 1-1/2 to 2 tons of salt per year are applied to each acre of land by irrigation water alone. Eventually this salt must be removed or the buildup, year after year, will reduce crop productivity and crop selection.

46. What kinds of irrigation methods are used in the problem area? (M)

Sprinkler irrigation and furrow irrigation with siphons or gated pipe are commonly used.

47. Why is there farming in the first place in highly saline soils? (SF)

Farming on most of these lands began in the late 1800's. The lands are fertile, the weather is ideal for growing crops, and, with adequate water supplies, the area is very productive. In areas where the irrigation supplies were high in salts and soil conditions prevented adequate drainage, salts accumulated in the soils.

48. How many acres of land are currently out of production because of salt? (M)

As far as we know, no large fields have gone completely out of production during the last 20 or so years as a result of salt problems. However, agricultural productivity has declined significantly on lands with drainage problems and salt buildup. Numerous small areas (10 to 50 acres) are out of production, and farmers have had to restrict cropping on some lands to salt-tolerant crops.

49. What percentage of the San Joaquin Valley is affected by the salt problem? (M)

Estimates indicate about 1.0 million acres may eventually be affected by drainage problems within the valley. About 250,000 acres in the San Luis Unit and Delta-Mendota Canal service areas currently have high ground-water and associated salt-buildup problems.

Eventually, 500,000 acres of land in the Federal service area will have salt and high ground-water problems.

Evaporation Ponds and Desalinization

50. Are farmers allowed to put in their own ponds? (F)

Yes, but the evaporation ponds must be developed according to criteria applicable under Federal and State laws.

51. What would happen to the salts after evaporation or desalinization takes place? Would the volume be so great that it would be impossible to move them? (F, LB, M, S, C)

The salts could be used in solar ponds to generate electricity, stored in disposal sites near evaporation ponds, or hauled to the ocean or inland sites for disposal.

52. If disposal were to take place onsite, would a certain amount of land be set aside for that purpose? (S)

Evaporation ponds and associated salt-disposal areas could require the dedication of over 70,000 acres of land to serve the nearly 500,000 acres in the Federal service area that will eventually need drainage.

53. Would onsite disposal contaminate ground water? (S)

Any onsite disposal facility would be subject to State requirements developed to protect ground-water supplies from contamination.

54. What is the status of the State's desalting facility? (LB)

The DWR desalting plant near Los Banos is not yet fully operational. The plant is being modified to pretreat drainage water, which is necessary before desalinization studies using the reverse-osmosis membranes can be started.

55. Does vegetation around the ponds absorb selenium, posing a danger? (S)

Vegetation growing in ponds accumulates the selenium present in the water. Unless waterfowl were kept away from them, the ponds could pose a hazard similar to that at Kesterson Reservoir.

Ocean/Bay Discharge

56. Is Delta discharge still an alternative? (C)

Discharge to the Delta is one of several alternatives being considered for restudy. A plan for discharge to the Delta could

consider treatment facilities in order to meet water-quality standards established to protect beneficial uses.

57. Are you considering new discharge points in Monterey Bay? (C)

Bay and ocean discharge points are being considered, but specific locations have not been identified. Evaluation of all sites will include consideration of treatment facilities to meet water-quality standards.

58. Would discharge be a point source? (SF)

Yes.

59. What effect would the drainage water have on the ocean or the San Francisco Bay? (All)

Drainage-water effects will be evaluated for all disposal sites considered. Alternatives will be formulated in a manner that will protect the beneficial uses of any potential receiving water.

60. What effect would highly diluted drainage water have on Delta or ocean receiving waters? (F)

The effluent limits established by the State Water Resources Control Board (State Board) for the discharge of any agricultural drainage water and specific dilution requirements will be designed to safeguard the receiving waters.

61. What effect would Delta discharge have on fisheries? (F)

The results of ongoing and planned studies will help answer this question.

62. Would discharged water meet drinking-water standards? (C)

Yes, if the beneficial uses of the receiving water include domestic use.

63. What happened to the proposal to discharge undiluted water? (S)

All disposal alternatives would include facilities to diffuse the drainage water into the receiving water body to achieve a minimum dilution of 1:10.

64. The San Francisco Bay is already saline. How can saline drainage cause degradation? (S)

Salinity degradation would not occur if the discharge were made west of Pittsburg, assuming application of existing standards as

adopted by the State Board. However, the drainage water currently contains other chemical and trace elements of concern.

INTERIM SOLUTIONS AT KESTERSON RESERVOIR

65. Has a legislated date been set for undertaking a short-term solution at Kesterson? (F)

The Cleanup and Abatement Order issued by the State Board on February 5, 1985, directs the Bureau to clean up Kesterson Reservoir within 3 years. On March 15, 1985, Secretary of the Interior Donald Hodel ordered the Bureau and the FWS to begin the process of shutting down Kesterson. In accordance with an agreement reached April 3, 1985, between the Department of the Interior and Westlands Water District, discharges to the San Luis Drain north of Bass Avenue will be phased down beginning in September 1985 and winding up by June 30, 1986, when all such discharges to the drain will be terminated.

66. What is the current plan for Kesterson? (SF)

The State Board order directs the Bureau to submit a plan for correcting current problems at Kesterson Reservoir to the State Board by July 5, 1985.

67. What part of Kesterson is the California Department of Fish and Game planning to close? (M)

In September 1984, the California Department of Fish and Game (DFG) and the FWS closed Kesterson Reservoir (which comprises 21 percent of Kesterson National Wildlife Refuge) to all hunting. The remainder of the refuge has also been closed to hunting of coots.

68. Would draining Kesterson stabilize the area now? (F)

Not necessarily. In addition to draining Kesterson, all vegetation would have to be removed, and the reservoir may have to be covered with a layer of soil to protect birds and mammals.

69. Is Kesterson a permanent part of the San Luis Drain? (LB)

Kesterson Reservoir was designed as a permanent feature of the San Luis Unit drainage facilities to regulate flows prior to discharge into the western Delta.

70. What is Kesterson's current holding capacity? (LB, S)

The current capacity of Kesterson Reservoir is approximately 4,300 acre-feet.

71. What is the inflow to Kesterson versus the evaporation rate? (LB)

Annual inflow to Kesterson Reservoir is estimated to vary from 6,500 to 8,500 acre-feet. The evaporation rate varies from 3 to 4-1/2 feet per year, which represents maximum evaporation from the reservoir of 3,600 to 5,400 acre-feet per year.

72. Does the concentration of the elements build up because of this evaporation and cause an aberration? (LB, C)

The concentration of salts within Kesterson has not increased significantly. If reservoir seepage were eliminated, then the salt concentrations would increase significantly, thus reducing the evaporation rate.

73. How many tons of salt have accumulated in Kesterson? (LB)

We don't know. The salt accumulation within Kesterson will be determined as part of studies required to meet the State Board's cleanup and abatement order.

74. Is a lot of water lost from Kesterson through seepage? (C)

Available data indicate the annual seepage rate could be as high as 60 percent of reservoir inflow. However, only insignificant amounts of selenium have been detected in the seeped water. It is suspected that selenium accumulates in vegetation and invertebrates and is adsorbed onto shallow soils.

75. Where does the seepage from Kesterson go? (S)

Seepage from Kesterson enters the shallow ground-water aquifer and generally moves in a northeasterly direction toward Salt Slough. The GS estimates the rate of movement to vary from 1.7 to 6.8 feet per year. Thus, water seeped from Kesterson would take over 1,000 years to reach Salt Slough.

76. What came first, the reservoir or the refuge? (S)

In 1968, the Bureau purchased 5,900 acres for the development of Kesterson Reservoir. Construction of the first phase of the reservoir was started in 1970 as part of the drain. In July 1970, the Bureau and the FWS signed a cooperative agreement for FWS management of Kesterson Reservoir and associated lands for the conservation and management of wildlife, thus establishing the area as Kesterson National Wildlife Refuge.

77. Since the Grasslands area is also working as a giant evaporation pond, do you predict that it will become another Kesterson if nothing is done? (LB, SF)

We don't know. The DFG, FWS, GS, and Bureau are studying the Grasslands area to quantify the effects of current water-management practices, including the use of subsurface drainage water for irrigation and for ponding during the waterfowl hunting season. The Bureau has provided the State Board with data from surface water in Grasslands which indicate that the concentrations of some elements are of similar magnitude as in Kesterson. The FWS has recently provided data which indicate that some birds in the south Grasslands area have elevated levels of selenium.

78. Could the State prevent Grasslands from accepting drainage water? (LB)

The cleanup and abatement order for Kesterson Reservoir requires the CVRWQCB to develop a management plan for the San Joaquin River basin. The plan is to consider drainage-water use in the Grasslands area, and it could impose restrictions on the use of that water.

79. Do you expect problems like those at Kesterson in other areas? (SF)

Wherever conditions similar to those at Kesterson Reservoir exist, with the occurrence of significant levels of selenium similar problems for waterfowl could develop. However, the design of future reservoirs could include measures to prevent significant impacts to waterfowl and other birds and mammals. Such measures would include increased reservoir depth and prevention of significant growth of emergent vegetation, fish, and invertebrates.

80. How long has drainage been going to Kesterson? (LB)

Small amounts of subsurface drainage water were first discharged into Kesterson Reservoir in 1978. Until 1980, however, most of the water stored in Kesterson consisted of surface water from local sources. Since 1981, most of the inflow to Kesterson has consisted of subsurface drainage water.

81. Is it necessary to have a permit to discharge to the drain? (LB)

The Federal Government must comply with existing Federal and State laws, which require a permit prior to discharge of the drain. Individual farmers or districts do not have to have a permit from the State to discharge to the drain, but they do have to have permission from the Bureau.

82. Is the water in the drain surface or subsurface drainage? (S)

Subsurface drainage water.

83. What happened to drainage before the San Luis Drain? (M)

Lands presently served by the San Luis Drain were previously affected by very saline shallow ground water within 5 feet of the land surface. These high water levels reduced agricultural productivity and restricted the choice of crops grown. They also caused greater migration of subsurface flows toward the San Joaquin River and Fresno Slough than occur today with service provided by the San Luis Drain.

84. Did the drain open up new agricultural usage? (M)

No new lands are being farmed as a result of construction of the San Luis Drain. The removal of subsurface drainage water has increased the agricultural productivity of the 8,000 acres being drained, allowing the farmers to grow a greater variety of crops.

85. How many of the 8,000 acres currently connected to the San Luis Drain have been added since 1981? (LB)

A moratorium on connecting onfarm subsurface agricultural drain systems to the San Luis Drain was imposed by the Bureau in 1981.

86. Are there tile drains on any of the land connected to the drain? (LB)

A total of 5,000 acres of land with onfarm tile drains discharge into a collector system that in turn discharges directly into the San Luis Drain.

87. What would happen now without the drain? (M)

Assuming no other drainage disposal alternative was available, approximately 108 miles of open-joint collector drains would have to be plugged at approximately 200 sumps. If the land were to continue to be irrigated, subsurface drainage water would collect near the surface of the soil near these sumps.

88. What was the reason for stopping the drain? Was information available prior to the stoppage as to where the drain would empty and what the effects would be? (S)

When construction of the drain began in 1968, the planned discharge location was at the Antioch Bridge in the western Sacramento-San Joaquin River Delta. In 1975, construction of the drain was stopped due to funding limitation and the need to satisfy a congressional requirement that additional technical studies be conducted and agreements be obtained from the State of California before the final discharge point was selected. Technical studies were begun to reassess a final discharge point and define requirements to meet State water-quality standards. These studies were

conducted as part of the Interagency Drainage Program, which was sponsored by the State Board, the DWR, and the Bureau.

89. What are the similarities between Colusa Drain and the San Luis Drain? (C)

There are no similarities between the Colusa Drain and the San Luis Drain. The San Luis Drain is used to carry subsurface drainage water; most of the inflow to the Colusa Drain is surface drainage. Concentrations of herbicides and pesticides in the Colusa Drain are of concern, whereas concentrations of these materials in the San Luis Drain are very low. In addition, the Colusa Drain is at times used to both supply irrigation water and remove drainage water.

90. What is being done to prevent overflow from Kesterson into the San Joaquin River? (C)

Overflow from Kesterson will be prevented by controlling inflow. Surface discharges into the San Luis Drain and Kesterson Reservoir are not permitted. Subsurface drainage discharges will be reduced beginning in October 1985, which will further reduce any likelihood of overtopping Kesterson.

91. What will happen to the bird population over the next 5 years? Can you minimize the effects? (SF)

The impact of Kesterson Reservoir on bird populations will depend on the success in limiting the birds' access to food within the reservoir with high levels of selenium and the effectiveness of the hazing program.

92. What happened to the alternative habitat promised by the Bureau? (C)

In October 1984, the Bureau began delivering additional freshwater supplies from the Delta to water districts and State and Federal wildlife areas in the Grasslands area to offset the loss of habitat at Kesterson. The Bureau delivered approximately 15,000 acre-feet of water to over 10,000 acres between October 1984 and April 1985 to coincide with the peak waterfowl migrations into the area and draining of private duck clubs and refuge lands.

93. What is the measurement in parts per billion (p/b) of selenium in the drainage water before it enters the drain, in the drain, and after it enters Kesterson? (LB, S)

The weighted average concentration of selenium in the drainage water is 335 ug/L (p/b) before the water is discharged into the drain. The average selenium concentrations in the drain and

Kesterson during the period March through September 1984 are 347 and 228 ug/L, respectively.

94. Is selenium the only cause of the wildlife problems at Kesterson? (LB, SF)

The results of studies conducted to date indicate that elevated selenium levels at Kesterson Reservoir were the cause of the severe reproduction problems experienced by birds there. Additional studies are planned to better determine the relationship between agricultural drainage water and wildlife health.

95. What happens to the selenium that seems to disappear from Kesterson? (S)

Studies planned by the GS and the Bureau will help answer this question. However, we believe that selenium is incorporated into the reservoir plants and sediments and may be adsorbed onto the soil as the water seeps into the shallow ground water.

96. What is the concentration of chromium in the drainwater? (M)

The average concentration of total chromium in the San Luis Drain is 17 ug/L (p/b).

97. Was there a mineral problem in the San Joaquin Valley before the drain was built? (F)

Yes. The concentrations of total dissolved solids were high in San Joaquin Valley streams that contained large amounts of subsurface drainage flow from the west side. In addition, most of these surface streams with a large percentage of subsurface drainage had high concentrations of nutrients. The problems associated with trace elements such as selenium were not detected prior to the operation of the San Luis Drain and Kesterson Reservoir. However, neither the FWS nor the DFG had studied trace-element impacts on area wildlife refuges or in the Grasslands prior to the discovery of waterfowl deformities at Kesterson.

STUDIES NECESSARY FOR CREDIBILITY

98. The problem of valley drainage has been studied for years and decisions were made on disposal. Why did the discovery of selenium cause everything to open up again? (M)

The discovery of high concentrations of selenium and its potential for adversely affecting waterfowl has raised questions about the need to treat drainage before discharge to the estuary or to any other water body. Trace-element concentrations as well as minimum-effect levels will be determined. Also, economic and environmental

impacts will be reevaluated to reflect the recently discovered drainage water contaminant problems.

99. Is the Bureau studying the entire San Joaquin Valley? (C)

The San Joaquin Valley Drainage Program will consider drainage problems throughout the San Joaquin Valley. The program will focus, however, on the Federal service area on the west side of the valley between the Delta and Kettleman City, based on this area's demonstrated interest in participating in a regional drainage-water management program and a congressional commitment to provide drainage service to the San Luis Unit service area.

100. What studies are being done in regard to human health? (All)

Programs will be initiated this summer to monitor both particulate and gaseous forms of selenium in the air. The California Department of Food and Agriculture (DFA), under contract to the Bureau, is conducting a study on selenium involving domestic animals, milk, and crops throughout the drainage service area. The DFA's report is expected to be finalized and published soon. Adult waterfowl and fish harvested from the Grasslands area are being tested to determine any public health risk from consumption of the birds and fish. Blood and urine samples from Government employees working in the Kesterson area are routinely analyzed for selenium. Water samples from domestic wells in the reservoir area are routinely analyzed for trace elements.

101. In what areas are you studying animals and plants? (All)

The DFA's survey included domestic animals, milk, and crops from the entire 1.2-million-acre drainage service area. Also, the U.S. Agricultural Research Service has conducted limited vegetation surveys within the drainage service area. The GS and DFG will analyze plants in the Grasslands area.

102. Are you studying the seven other wildlife refuges in the Kesterson area? (SF)

Yes. Federal and State fish and wildlife agencies are studying refuges within the Grasslands area.

103. How many acres are you really talking about as a current or potential problem? (C)

Approximately 500,000 acres of land in the Federal service area will ultimately require drainage facilities. The total acreage contributing high concentrations of drainage water contaminants will be determined in studies to be conducted by the GS.

104. It took 5 or 6 years for selenium to surface as a problem. What could happen next? (C)

The problems associated with selenium levels could have been observed at Kesterson Reservoir in 2 years if adequate monitoring had been conducted. Studies under the interagency program have been designed to evaluate the toxicity of the individual trace elements, and combinations of trace elements, found in significant amounts within the service area. State-of-the-art toxicological study procedures will be followed to ensure that the full range of potential impacts is evaluated.

105. Are you studying the effect of pesticides, herbicides, and fertilizers in combination with selenium and other trace elements? (FR, S)

Both acute and chronic toxicity tests will be done to assess the bioaccumulation of contaminants through the food chain and reflect the synergistic or antagonistic effects of soluble organics, fertilizers, and trace elements on various organisms typically found in potential receiving waters.

106. What kinds of tests of pesticides are available now that weren't 10 years ago? (LB)

Pesticide testing is much more sensitive today than it was 10 years ago. This is largely due to improved design of specific-element detectors and the development of liquid chromatography and capillary column instrumentation.

107. Are you looking at cumulative impacts? (F)

Yes.

108. Are you looking at short- or long-term effects? (LB)

Both, but mainly long-term.

109. Where else in the world has this problem arisen, and are there any solutions? (M)

Selenium and other trace elements have been measured in high concentrations in many areas of the world. Solutions depend on the precise nature and extent of the problem.

110. Are there any selenium experts in the world? (LB)

Yes. Several selenium experts from the United States and Canada have participated in workshops and conferences sponsored by the

Department of the Interior during the last 17 months. The interagency study team will continue to consult these experts throughout the study.

111. What kind of selenium studies are you doing? (LB, C)

Studies under way or proposed fall into three main categories: (1) Sources, concentration, mobility, and transport of selenium and other trace elements, (2) determination of minimum concentrations which adversely affect fish and wildlife resources, and (3) treatment for removal of trace elements.

112. How long does it take to determine biological effects? (LB)

For a toxicological laboratory analysis, a series of acute (96-hour) and chronic studies including food-chain bioaccumulation are required over a period of several months.

113. Typical daily adult intake of selenium is 60-120 ug per day, mostly from food. How much selenium is getting to our dinner tables? (C)

Studies being conducted by DFA are determining the levels of selenium and other trace elements in the samples collected from animals, milk, and crops. Also, the California Health Services Department has recommended to DFG and FWS selenium levels it considers safe in waterfowl.

114. Are you doing leaching studies? (F)

Proposed drainage investigations will evaluate leaching requirements within the soil profile and alternative means of reducing subsurface drainage volumes.

115. Will you study water and contaminants for mutagenic activity? (C)

Long-term biotoxicity studies are planned.

116. Are you studying bacterial models? (M)

Studies of this type are not anticipated.

117. Are you studying both surface and subsurface drainage? (LB)

Long-term studies will consider only subsurface drainage water. Short-term studies in the Grassland Water District service area will consider both surface and subsurface drainage water.

118. Are you studying bacteria in the Kesterson ponds? (SF)

This type of study is not anticipated at this time. However, the mechanisms removing selenium within the water seeping from the

reservoir will be evaluated. This process will probably include some bacteriological analysis.

119. Have you studied flushing with saltwater? (S)

This type of study is not anticipated at this time.

120. Has there been a geological survey of breaks in clay layer stratification? (F)

The GS is pursuing such a study.

121. Are trace elements in the San Joaquin River fish the same as they were 10 years ago? (S)

All available data will be evaluated to determine the impact of the subsurface agricultural drainage water on the San Joaquin River. There may not be sufficient historical data on fish tissue analysis for trace elements to answer this question, however.

122. How can you protect the San Joaquin River until this problem is solved? (C)

The limited water-quality data for the San Joaquin River do not indicate a significant degradation due to trace-element concentrations.

123. Does the Committee for Water Policy Consensus support the U.S. Geological Survey's San Francisco Bay effects findings? (SF)

It is not clear what "effects" this question refers to.

PUBLIC ATTITUDES

124. What is the cost per acre for study of the Kesterson area? (C)

Study costs for Kesterson Reservoir will be determined by July 1985, when the Bureau provides to the State Board a plan to close and clean up Kesterson Reservoir.

125. What is the cost of abandoning the land? (C)

The costs and impacts of abandoning the lands will be included in the Bureau's evaluation and report to the State Board in July 1985.

126. How much payment-in-kind money is currently being paid to farmers on the 8,000 acres draining into Kesterson? (SF)

No payment-in-kind monies are currently being paid to landowners in Westlands Water District, including the 8,000 acres draining into Kesterson.

127. Who owns the water? Why aren't there waste-disposal regulations for agricultural water? (C)

Under State water law, there is no "ownership" of water; the right to reasonably and beneficially use water is conferred by the State with a water right permit. While under control of the permittee (the United States) or its customers (the farmers receiving Central Valley Project water), the water may be characterized as being "owned"; however, "controlled" is a more accurate term to characterize its status. While water is under control of a permittee it may be used as described by the permittee in a reasonable and beneficial manner.

The State Board has determined that the Toxic Pits Act applies to agricultural drainage.

128. Do farmers have a legal right to the water? (C)

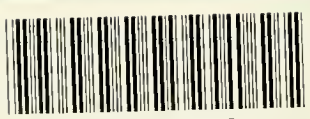
The farmer's right to water stems from contracts with the United States for water service (for example, Westlands Water District) or from contracts with the United States for water service in exchange for the United States' use of or the relinquishment of prior rights to the use of water from the San Joaquin River (for example, Central California Irrigation District).

129. Who would pay for water treatment? (M)

The project beneficiaries would repay the capital and operation and maintenance cost of all facilities, including those related to treatment.

130. What is the cost of a solution? (C)

Plan selection and final cost estimates will not be determined until after the interagency studies have been completed.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